

Appendix D

Estimating and Presenting Power Sector Fuel Use

I. Background

The Energy Information Administration (EIA) has comprehensively reviewed and revised how it collects, estimates, and reports fuel use for facilities producing electricity. The review addressed inconsistent reporting of the fuels used for electric power and changes in the electric power marketplace that have been inconsistently represented in various EIA survey forms and publications. For example:

- In some cases fuel use by combined-heat-and-power (CHP) plants¹ has been reported as industrial sector fuel use, while in other cases it has been reported as electric power sector fuel use.
- Electricity generation and fuel consumption have been categorized and reported in several different ways, such as (1) utility only; (2) utility and independent power producers; or (3) utility, independent power producers, and CHP plants. The restructuring of the power industry is making some of these categories less meaningful.

The goal of EIA's comprehensive review was to improve the quality and consistency of its electric power data throughout all data and analysis products. Because power facilities operate in all sectors of the economy (e.g., in commercial buildings, such as hospitals and college campuses, and industrial facilities, such as paper mills and refineries) and use many fuels, any change to electric power data affects data series in nearly all fuel areas and causes changes in a wide variety of EIA publications.

As a result of the comprehensive review, EIA has made the following changes:

- EIA has adjusted all presentations of data on electric power to a consistent format and defined the electric power sector to include electricity-only plants and CHP plants whose primary business is to sell electricity, or electricity and heat, to the public.
- EIA is providing details within the electric power sector, commercial sector, and industrial sector on fuel used by CHP plants in those sectors.
- EIA has changed the sources of data on fuel used by components of the electric power sector. All tabulations and publications will use data obtained from EIA's surveys of electric power generators. This change in data source contributes to changes in total fuel consumption of natural gas.
- EIA has revised its historical data on electric power to resolve data anomalies. The revisions contribute to changes in EIA's electricity series as well as the fuel-use series.

Appendix D describes the reasoning behind the changes and their effect on electric power publications. It is organized as follows:

- Section II provides an overview of the key changes.
- Section III provides specific information for electric power publications.

The Annual Energy Review (AER) 2001, the first of the annual publications to be released with the new formats, provides details on changes for publications on coal, natural gas, petroleum, renewable energy, and greenhouse gas emissions.

II. Overview of Key Changes

The many changes that will occur because of the fuel review generally fall into three broad categories: (1) the categorization of electric power facilities, (2) the reporting of combined-heat-and-power plant fuel use, and (3) data series revisions resulting from revised electric power fuel use estimates. Each of these areas is discussed below.

Categorization of Electric Power Facilities

Until the 1990s, most electric power generation and fuel use data could be meaningfully categorized into electric utilities and nonutility power producers.² Electric utilities were generally structured as vertically integrated³ power companies that were responsible for generating, transmitting, and distributing power to consumers within their franchised service territory.

¹ Combined-heat-and-power plants (CHPs) produce both electricity and useful thermal output. EIA formerly referred to these plants as cogenerators, but has determined that CHP better describes the facilities because some of the plants included in EIA's data do not produce heat and power in a sequential fashion, and as a result do not meet the legal definition of cogeneration specified in the Public Utility Regulatory Policies Act (PURPA).

² For an example of this, see *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2, December 1999.

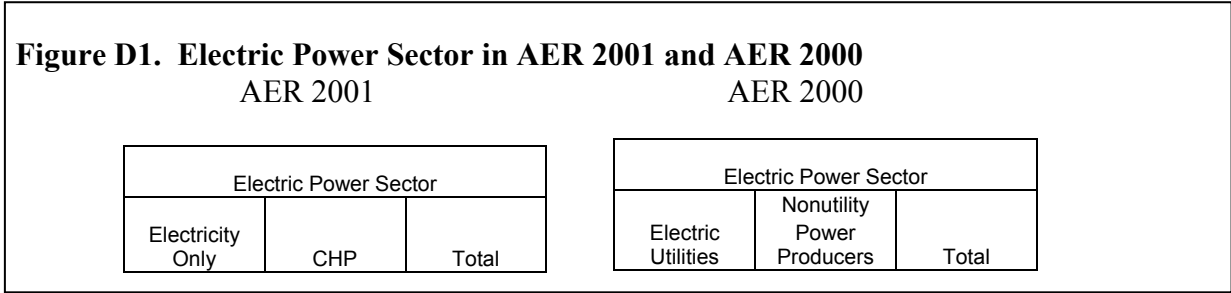
³ In this context "integrated" means that the company is involved in the three main sectors of the electric power business—generation, transmission, and distribution.

Nonutility power producers were generally independent generators—mostly combined-heat-and-power plants—that produced some power for their own use and sold the remainder to utilities for distribution to consumers. However, in recent years, many formerly integrated utilities have split apart, spinning off the generating part of their business into separate companies. Independent developers have built most of the new generating capacity that has been installed in recent years. As a result, the distinction between utility and nonutility power plants has become much less meaningful. In fact, a large portion of the growth in nonutility generation in recent years is due to the reclassification of utility power plants as nonutility power plants.

To reflect the changing industry structure, EIA is now organizing electric power generation and fuel use data into two new categories: electricity-only and combined-heat-and-power (CHP) plants. These categories separate power plants by function; i.e., power only or power plus thermal, rather than by ownership class.

Electricity-only plants represent all plants, whether owned by utilities or nonutilities that produce only electricity. CHP plants represent entities that produce both electricity and some form of thermal energy. Both categories will have some facilities that are owned by traditional utilities and independent companies.

In addition, EIA is now presenting data for an electric power sector that includes electricity-only plants and CHP plants whose primary business is to sell electricity, or electricity and heat, to the public (North American Industry Classification System code 22). This contrasts with some previous data presentations in which the electric power sector included non-NAICS code 22 industrial and commercial CHP plants. Figure D1 provides an example from the Annual Energy Review (AER).



In some tables and publications, the electric power sector will continue to be broken down into electric utilities and independent power producers for customers who have expressed an interest in this breakout. For example, Table 8.1 of AER 2001 presents an electricity overview and shows data on net generation for electric utilities and independent power producers separately. It is the only table in AER 2001 that has this break-out (Figure D2).

Figure D2. Electric Utilities and Independent Power Producers are shown separately in Electricity Overview

Table 8.1 Electricity Overview, 1949-2001
(Billion Kilowatthours)

Year	Net Generation					
	Electric Power Sector 1			Commercial Sector ²	Industrial Sector ³	Total
	Electric Utilities	Independent Power Producers	Total			

¹The electric power sector (electric utilities and independent power producers) comprises electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public—i.e., NAICS 22 plants. Due to the restructuring of the electric power sector, the sale of generation assets is resulting in a reclassification of plants from electric utilities to independent power producers.

²Commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Appendix G for commercial sector NAICS codes.

³Industrial combined-heat-and-power (CHP) and industrial electricity-only plants. Through 1988, includes industrial hydroelectric power only. See Appendix G for industrial sector NAICS codes.

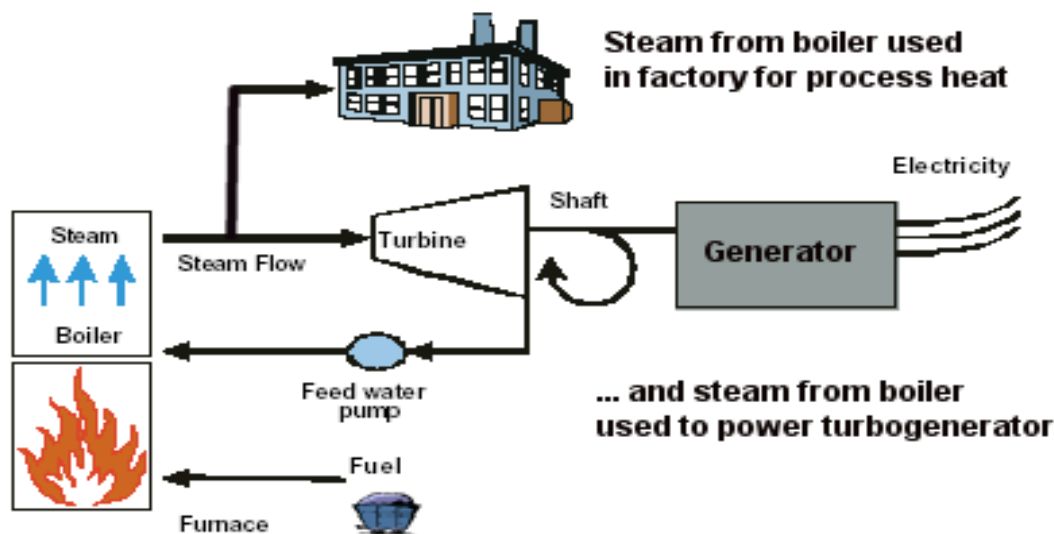
Reporting of CHP Facility Fuel Use

Historically, fuel consumption in CHP plants has been combined with other uses in many EIA publications. For example, in some tables the use of natural gas in commercial and industrial CHP plants was included with other commercial and industrial uses. Further, some of the fuel consumption (the portion associated with electricity production) at these same facilities was also reported under the column labeled “Nonutility Power Producers.” Based on questions received, it became clear that this categorization led to confusion for many EIA customers.

EIA is now distinguishing within the industrial, commercial, and electric power sectors what portion of fuel consumption is used in CHP facilities and non-CHP facilities. For example:

- In tabulations of energy use by economic sector, if a commercial or industrial facility has a CHP unit, the total fuel consumption for that unit will be reported under commercial or industrial, but it will be identified separately from other commercial or industrial consumption. CHP plants that report their primary business is generating and selling power to others will be reported in a separate column in the electric power sector.
- In tabulations of energy use to produce electric power, the total fuel consumption reported by CHP plants will be further separated into that which is used to produce electricity and that which is used to produce thermal energy.⁴ Figure D3 shows a schematic for combined heat and power producers.

Figure D3. Schematic for Combined Heat and Power Plant



The separation between electricity and thermal uses is being done because many EIA data users have expressed interest in knowing how much fuel is used to produce electricity in the United States.

Data Series Revisions Resulting From Changes in Electric Power Fuel Use Estimates

The revisions to electric power data affect many areas. For example, to estimate natural gas use EIA has historically surveyed natural gas pipeline-companies and local gas utilities to obtain data on natural gas used by residential, commercial, industrial, and electric utility, and nonutility generators.⁵ However, EIA also surveyed electric utilities on their natural gas use. These data obtained directly from the end user were generally thought to be more accurate than the data obtained from natural gas suppliers. As a result, total natural gas use was estimated by adding together the data from natural gas companies on residential, commercial, industrial, and nonutility power producer use to the amount reported directly by electric utilities. The data collected for nonutility power producers were included with industrial use in previous EIA natural gas publications.

With the changing structure of the electricity sector, this reporting approach no longer appears reasonable. EIA has decided to follow the procedure described for electric utilities and use data obtained from its direct surveys of nonutility electric generators rather than the natural gas supplier surveys.⁶

Data changes are also occurring because of the extensive review of reported data that was undertaken in this process. Since it was decided that data reported directly by utilities and nonutility power generators would be the primary source of fuel consumption data for the power sector, an examination of heat rates,⁷ capacity factors,⁸ and power-to-steam ratios across 12 years of reported data was conducted. As a result, data for nonutility power producers for 1989 through 2000 have been

⁴ For the method used to separate the fuel used at CHP plants between electricity and useful thermal energy production, see Section III.

⁵ Energy Information Administration, Form EIA-176, "Annual Report of Natural and Supplemental Gas Supply and Disposition."

⁶ Energy Information Administration, Form EIA-759, "Monthly Power Plant Report" for electric utilities and Forms EIA-867 and EIA-860B, "Annual Electric Generator Report-Nonutility" for nonutilities. Starting with 2001, data for both utilities and nonutilities are collected on a new survey, Form EIA-906, "Power Plant Report."

⁷ Heat rates are computed by dividing the heat content of the fuel burned to generate electricity by the resulting net kilowatt-hour generation.

⁸ Capacity factors are the ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

revised. The data review procedure is described in Section III under the heading “Efforts to Improve Data.” As a result of the review by expert EIA analysts, anomalous values have been investigated and resolved and the result is higher quality data at aggregated levels.

Revisions resulting from changing the source of fuel consumption data for nonutilities and from EIA’s data review affect data beyond the category of nonutilities. Appendix H of AER 2001 provides examples.

III. Electric Power Surveys and Publications

Summary of Key Changes

EIA previously presented data on electric power, such as generation and fuel consumption, in the following categories:

- Electric utilities,
- Nonutility power producers (independent power producers and combined-heat-and power plants),
- Electric power industry (sum of electric utilities and nonutility power producers).

Now EIA is organizing data using the following new categories:

- Electricity-only plants,
- Combined-heat-and-power (CHP) plants.

Data on electricity-only plants are disaggregated for utilities and independent power producers, as there are customers who are interested in maintaining this distinction. Data on CHP plants are disaggregated by the end-use category (commercial, industrial, electric power) they report as their major line of business. The categorization is based on their North American Industrial Classification System code. For example, a CHP plant that is part of a hospital will be classified as “commercial.” Similarly, a CHP plant that reports that it is part of a paper mill will be classified as “industrial,” and a CHP plant that reports that its primary business is selling power to others will be classified as “electric power.” In addition, EIA is defining the electric power sector to include electricity-only plants and CHP plants whose primary business is to sell electricity, or electricity and heat, to the public.

EIA is presenting data for the following categories:

- Electric Power Sector,
- Commercial and industrial CHP plants,
- Total (sum of Electric Power Sector plus commercial and industrial CHP plants and equal to the prior “electric power industry” category).

Another change is that, EIA has estimated and is presenting data on the amount of fuel used to generate electricity and the amount of fuel used for useful thermal output. Furthermore, during the course of recategorizing the data, EIA performed a thorough data quality review and revised data to resolve anomalies.

Efforts to Improve Data

EIA reviewed electric power data from 1989 through 2001 to determine whether there were anomalies. The 1989–2000 data for nonutilities were from Form EIA-860B, “Annual Electric Generator Report-Nonutility,” and its predecessor, Form EIA-867, “Annual Nonutility Power Producer Report.” The 2001 data are from Form EIA-906, “Power Plant Report.” These forms collect data on fuel consumption, generation, and, with the exception of 1995 through 1997, useful thermal output. When anomalies were identified in the data for the more recent years (1998–2001), EIA contacted selected respondents to resolve the inconsistencies. For the older data it was not practical to contact respondents. In this situation EIA made data adjustments to resolve the anomalies.

The review included an examination of both respondent-level data and aggregate-level data. EIA reviewed data for facilities with heat rates greater than 40,000 Btu per kilowatthour and less than 5,000 Btu per kilowatthour. The upper limit was chosen to allow for the heat rates of older non-electricity boilers. In addition, EIA reviewed data for facilities with overall efficiency of greater than 100 percent and identified facilities with thermal output that were not designated as CHP plants. To ensure consistency, EIA compared North American Industry Classification System (NAICS) codes, cogenerator status, fuel consumption, electric generation, and thermal output levels over time.

EIA analysts reviewed and evaluated aggregate-level data by State, NAICS code, fuel type, and generator type. For the historical data (1989–1997), EIA also:

- Estimated a value for useful thermal output for 1995 through 1997 (when useful thermal output was not included on the survey form) that produced a heat rate and an efficiency consistent with that observed in other years (see discussion below on CHP fuel use methodology).
- Corrected errors in units reported for fuel consumption.
- Compared data on fuel consumption with data on electric generation and adjusted data on fuel consumption or generation to maintain a consistent ratio.
- Adjusted data on useful thermal output for those respondents with heat rates outside the 5,000-to-40,000 Btu per kilowatthour range and an efficiency consistent with other years.

For the 1998-2000 data, the review also included a comparison for consistency with data reported by manufacturing plants on Form EIA-3, "Quarterly Coal Consumption—Manufacturing Plants," since a subset of the EIA-3 manufacturing plants generate electricity and also reported on the electric generator survey Form EIA-860B. In general, there was good correspondence between the data submissions. In situations where there were inconsistencies, selected respondents were contacted to explain the differences.

Allocating CHP Fuel Use

EIA developed the following method for estimating how the total fuel consumed in the boiler is split between electricity generation and useful thermal output:

- First, a steam boiler efficiency rate of 80 percent was assumed.⁹
- Then the reported or estimated value for useful thermal output (in Btu) was divided by 0.8 to estimate the fuel used to generate this amount of thermal output.
- Next, this value was subtracted from total fuel consumption and the remainder was assumed to be the amount used for electric generation.

Electric Power Publication Tables Affected

In both the *Electric Power Monthly* and the *Monthly Energy Review*:

- Data will be shown for the following categories throughout most of the report: (1) all U.S. power producers, (2) electric power sector, and (3) commercial and industrial CHP plants. Data on fuel consumption are shown for both electric generation and thermal output.
- The lowest level of aggregation is at the State level.
- Data on petroleum coke are converted to barrels and included in petroleum consumption and stocks tables.
- Fuel types are revised to be consistent with the *Annual Energy Review*.

⁹ Arthur D. Little, Report to the Energy Information Administration, *Industrial Model: Update on Energy Use and Industrial Characteristics*, (September 2001), Appendix C, "Average Boiler Efficiencies."